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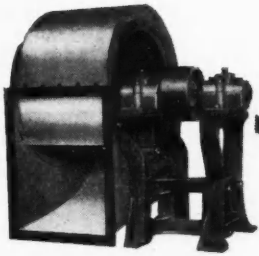

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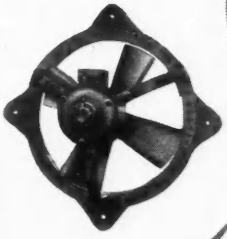

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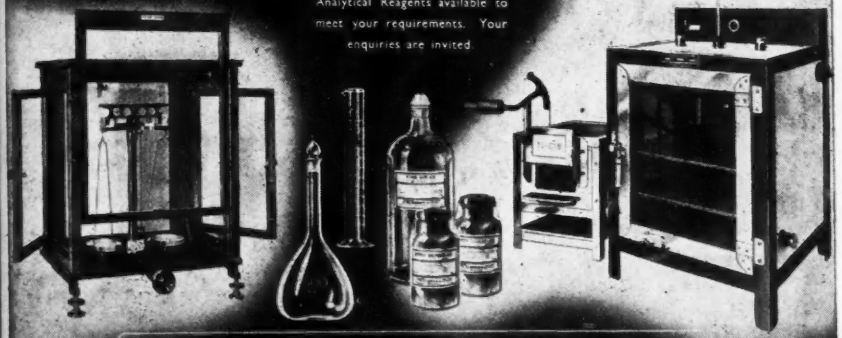

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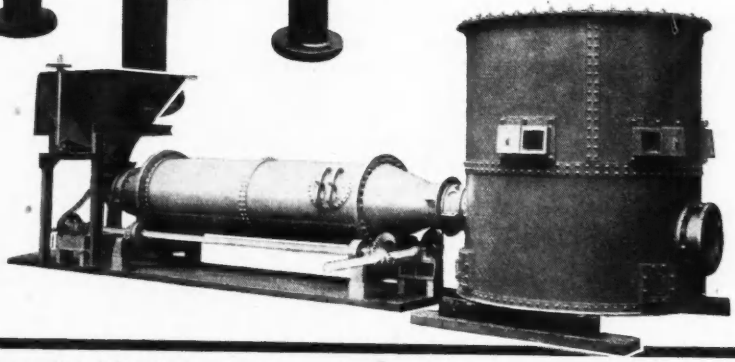

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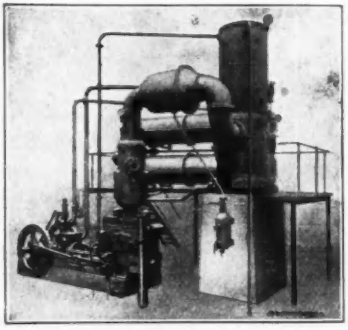

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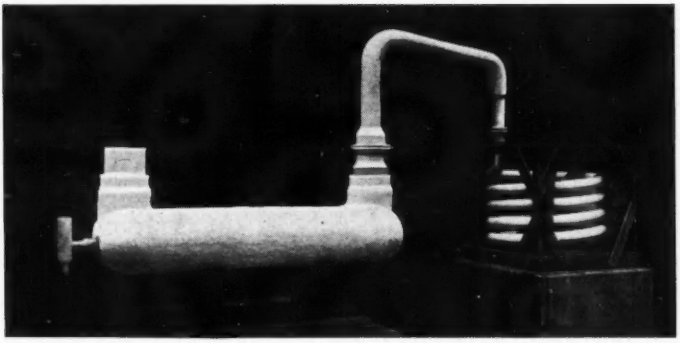

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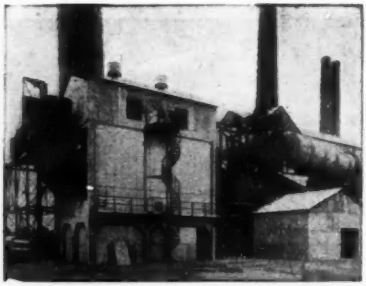

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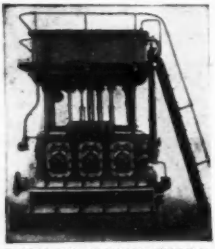

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Rehabilitation by Science

MR. J. M. KEYNES, the well-known economist, has stated publicly that in his opinion it will take us three years to recover from the effects of the war. It is good to find optimism among economists; it is very rare to find greater optimism in economists than in the commoner man for whom the economists prescribe. One feels that when Mr. Keynes is hopeful, it is not "the barren optimistic sophistries of comfortable moles," but it is based on some sound foundation of fact or knowledge. In the light of the facts discussed in recent leading articles in this journal the economic layman may be forgiven if he wonders whether it will in fact be possible in so short a time to unravel the skein which the exigencies of war have so greatly tangled. Mr. Keynes believes that during that period "we must willingly submit to a discipline progressively less severe than in time of war, but nevertheless more difficult to bear in time of peace." We mistrust the sound of that; it seems too much like the voice of bureaucracy staking a claim to continued existence after the foundations of its birth have been swept away.

Nevertheless, there must be planning after the war; on that we have always insisted. This country has to find means for making good not only the broken threads of its national life, but also the fabric of its economic existence that was based on international trade and finance. On our success in so doing depends our very future. If the Government can announce a plan for bringing these immeasurably difficult tasks to successful conclusions, this country will not be dismayed if some wise measure of control is allowed to remain. It insists, however, that the control shall be on sound business lines, and not a thinly veiled imposition of wild socialism.

There is an example of controlled planning in the methods by which Russia has advanced from the chaos of 1919 to the orderly power of 1942. It is not our view that the methods that were suitable for Russia would be suitable for this country. The conditions of life, the development of industry and education, the mentality of the two peoples were all very different in 1919. Nevertheless, it is useful to inquire whether anything can be learned from the way in which Russia handled a similar problem in the early years of the Bolshevik State. The inquiry appears to be the more promising because the transformation was wrought by the appli-

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tion of science It has been our contention as expressed in these columns that salvation will come to us through the application of science. Scientific research will open up those new horizons that await discovery, those new paths to trade and industry that must be discovered before mankind can once more advance along the road to civilisation. Russia was in 1919 a country in which science played but an insignificant part: in 1942 it is a country based on applied science.

Science probably first came to Russia in 1725 when the Imperial Academy of Sciences was founded: it was staffed entirely by foreigners—men such as Euler, the Bernouillis, and Gmelin. This scientific leaven did not affect the whole, however, and Russia remained a backward country, producing a few great men of science, but no scientific outlook among either the masses or the classes. Most of what had been achieved was wiped out by the Revolution, and it has been recorded that in 1919 there were only 40 physicists in the whole vast country. The few that were left had to educate the scientists of the future, and to develop, by their research and experience, the great natural resources of the country. Agriculture had to be organised, for the people starved; industry had to be organised to produce agricultural machinery and to pay for the necessary foreign imports. The consequence was that pure science and long-range work had to be neglected and the few scientific men who were left or who could be induced to work in Russia had to devote their energies to applied research and invention. Successive five-year plans were devised by the technical men, and research was undertaken on a mass scale, fully organised and even regimented, towards the end in view.

The result of all this has been many discoveries of outstanding scientific and economic importance in botany, agriculture, physics, technology, medicine, and so forth. These have been essentially practical discoveries and their exploitation was beginning to make life more bearable for the great masses of the people than it had ever been before. The Russian people had to submit to regimentation, deprivation, even downright starvation at times during the period of development; once the lean years were over they could have looked forward to a constantly improving standard of living and even to ultimate luxury—but for Hitler and his Nazis.

The practical question is whether this is to be the history of the whole civilised world in the decades to come. It is certain that the world must climb slowly and painfully back to solvency and freely-flowing international trade. It is certain-moreover, that by the intensive development of science, trade channels can be widened and deepened. The world has already a great start on the Russia of 1919. What we have to decide, and quickly, is how we shall plan our post-war research as part of a major policy to achieve the objectives desired in the shortest possible time. If we are successful in planning for the future in this way, Keynes's prophecy may yet be triumphantly vindicated. But the mills of science, like the mills of God, often grind slowly.

NOTES AND COMMENTS

An Urgent Question

WITH the rapid approach of winter and the continued exhortations of the Government in mind, we make no apology for harping on the question of fuel economy. In this issue we print the beginning of the second in the series of Dr. Howat's valuable articles indicating how the chemical engineer has achieved a great measure of fuel economy by his ingenuity and skill, and how manufacturers, whether of chemicals or other commodities, can make use of this skill in the hour of the nation's need. The facts he recounts and the points he raises are well worth the study of all industrial users of fuel. We have always insisted that the chemical engineer was a rather more important person in the national economy that he in his modesty was perhaps always ready to admit. In these difficult times his importance is greater than ever. But added importance carries with it added responsibilities, and it is the duty of every chemical engineer to apply his knowledge and his general wiliness in dealing with the management of plant to the all-important business of increased efficiency of fuel-utilisation. There *may* be some chemical

engineers who are shirking their duties, but we should like to asseverate here and now that we have not yet heard of them. Our object in these columns is to remind all concerned that chemical engineers do exist and are the very men to consult for the problems that now loom largest in the industrial world.

Combines and Nationalisation

THE question "to nationalise or not to nationalise" is constantly under discussion in one place or another these days. The advocates range from the "mild" nationalisers who would like to see public utilities state-owned, to the people who want all the means of production taken from the hands of private enterprise. The city editor of the *News Chronicle* believes that the big combines —"tobacco it may be or chemicals"— have established themselves in so strong a position that, "though technically monopolies and not completely free from competition, they can, and do, enjoy a great many advantages of real monopoly." He comes to the conclusion that these large concerns are not fit subjects for conversion into "public corporations," as such corporations would have to rely on the same means as the big companies for balancing their accounts. It is true that many of these million-pound concerns are run with an independence which seems little different from monopoly, but the question as to who should own them is surely also bound up with the problem of who can operate them most beneficially for the community. The research work that goes on in these "monopolistic combines" is prodigious. Often it takes place without regard to what profits it will yield, and the results are frequently given to the community in the form of help and advice to industrial enterprises that have not the same resources.

"The Child of Science"

MR. WALTER ELLIOT, in an article in *The Times*, concerns himself less with the control of industry than with the broader aspect of international trade. He provides his own text in the phrase: "The twentieth century state, in its special qualities, is the child of science." Mr. Elliot believes that the dominant conditions after the war will be short-term deficiencies and long-term surpluses, the former being centred in Europe and parts of Asia and the latter arising all over the world. The long-term difficulties are the tougher because they arise from the continuing progress of the machine age, which has made great strides even during the war. Placing the responsibility for a "swamp" of production to a large extent on science, Mr. Elliott said: "Science has made transit infinitely swifter and easier. It has made production swifter and easier also; and, still more important, it makes more possible the production in all lands of what used to be the speciality of one."

Relying on the Chemist

NOBODY now worried about Tyrian purple, he said; at least no one who could lay his hands on a bucket of coal-tar and a chemist to get the colours out of it. Again, the Japanese had in some ways more to fear from the rayon industry than from the American aircraft-carriers; for silk was Japan's speciality, one of her great materials of exchange, and when silk as good as hers could be made in every factory in America, what would access to those markets avail the Japanese? With regard to the question of payment of international debts, Mr. Walter Elliot referred to the "interesting and unrecognised fact" that even in the century of equipment a great deal of equipment was handed over gratis. It was probable that, taking international trade as a whole, for every locomotive, every ton of steel rails, every dynamo, every loom, every water or sewer pipe that we had sent abroad and been paid for, we had given one free, or had its price repudiated. The experience of other "investing" countries had probably been the same. Mr. Elliot leaves one with the conviction that world trade cannot be left this time to assume what shape it will. Planning, with the Atlantic Charter as the corner stone to a well-constructed edifice of international trade, holds the solution.

More details are now available concerning the development of power-alcohol production from surplus Australian grain. The first of the four distilleries will cost about £400,000, and will employ 80 permanent hands. This factory is in the heart of the New South Wales wheat belt; Victoria, South Australia, and Western Australia will each have a distillery of corresponding size.

Steam Economy and CO_2

The Importance of Accurate Measurement

by D. D. HOWAT, B.Sc., Ph.D., A.I.C., A.Inst.M.M.

WHEN fuel of known calorific value is burned in a boiler to raise steam the theoretical quantity of air required to effect complete combustion may easily be calculated. Perfect combustion will, however, occur only if: 1. Each particle of fuel is brought into the necessary intimate contact with the theoretical amount of air; and 2. The mixture of air and fuel is maintained at the required temperature until oxidation is complete. Such conditions do not obtain in ordinary practice and the quantity of air supplied to a boiler must be considerably in excess of the theoretical amount. The exact amount of excess air required is a matter not always easily determined.

The arguments against a large excess of air—high flue-gas temperature and consequent waste of fuel in heating the stack gases—are very obvious. Reducing the amount of excess air below a certain point, however, will give rise to any or all of the following difficulties: (a) The presence of carbon monoxide, hydrogen or hydrocarbons in the flue gases; (b) the emission of excessive smoke; (c) the presence of unburned carbon in the ash; (d) increased cost of furnace maintenance. An undoubted gain in boiler efficiency may be procured by reducing the amount of excess air, the higher temperature obtained being conducive to more complete combustion and heat absorption. Against this, however, must be set the increased slagging and erosion of refractories, burning and scaling of stoker parts, and the formation of clinkers.

Reduction of Excess Air

Some compromise must necessarily be effected and the amount of excess air reduced to the minimum consistent with good furnace conditions. With some types of boiler, such as various modifications of stoker-firing, complete combustion of the fuel does not take place. The excess air required for complete combustion would carry off more heat in the flue gases than the loss of fuel in slightly incomplete combustion. Again, a definite percentage of excess air cannot be specified as the total air required to give highest boiler efficiency will depend upon: (a) the characteristics of the fuel; (b) the method of firing; (c) the mixing of the air and fuel; (d) the rate of evaporation.

This last factor is quite important in a number of ways—a pulverised-fuel-fired boiler with water-cooled walls may normally be operated with about 20 per cent. excess air at all ratings. With refractory walls 30 per cent. excess air may be required at low ratings to prevent excessive smoke emission. At higher ratings with higher temperatures aiding combustion in the furnace the excess may be dropped to 15 per cent. without excessive smoke or refractory deterioration. If still higher boiler ratings are demanded the excess air must be increased again to prevent excessive slagging of the refractories.

Flue-Gas Temperature and Composition

For any given load on the boiler the temperature of the flue gases is found to decrease with increase in the CO_2 content up to the optimum CO_2 content. The relation of flue-gas temperature and CO_2 content to the total heat loss in the flue gas is shown by Siegerts' formula:

$$\text{Heat Loss (per cent.)} = K\frac{T - t}{C}$$

where K = constant dependent on type of fuel.
T = temperature of flue gases.
t = temperature of inlet air to the boiler.
C = per cent. of CO_2 by volume.

Increasing the amount of CO_2 in the flue gases beyond a certain practical limit may not produce a decrease in total heat loss, as unburned gases (CO and H) may still exist even in the presence of excess air from imperfect mixing of air and fuel. One per cent. of CO in the flue gases means that 1/15th of the total carbon is yielding only 30 per cent. of its total heat-giving capacity. In other words, there is a loss of almost 5 per cent. of the total carbon burned. Assuming a flue gas temperature of 200° C., a CO_2 content of 11 per cent. in the flue gas represents a loss of 12 per cent. heat. With 14 per cent. CO_2 and 1 per cent. CO the heat loss is 14 per cent. The installation working

with a high CO_2 content but with 1 per cent. CO is therefore suffering a greater heat loss than one with a CO_2 content 3 per cent. lower. Under normal conditions optimum combustion is usually associated with a CO_2 content of 10 to 14 per cent. Between 0.2 and 0.3 per cent. CO and H may be allowed in the flue gases if a simultaneous increase of more than 1 per cent. of total CO_2 occurs, provided that the flue-gas temperature remains constant. The volume of excess air should be regulated to bring about these conditions.

An accurate and trustworthy CO_2 meter will prove of great assistance in the boiler room in securing efficient combustion and smooth working. Several commercial types of continuously indicating and recording CO_2 meters have shown their accuracy and reliability. The two main types of meter may be classed as the chemical and the electric, advantages and disadvantages being associated with both types.

The Electroflo CO_2 meter, working on the principle of the Orsat CO_2 analysis apparatus, may be taken as a very good example of a chemical-type indicator. A measured sample, drawn from the flue, is passed through a solution of caustic potash, the CO_2 content being equivalent to the reduction in volume of the original measured sample. The instrument measures the actual CO_2 content and the accuracy of the results obtained is claimed to be unaffected by temperature, chimney draught, gas velocity or atmospheric pressure. A line drawing of the apparatus is shown in Fig. 1.

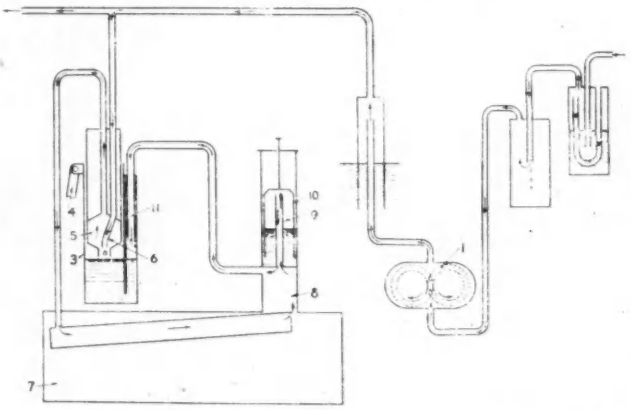


Fig. 1. Electroflo chemical-type CO_2 meter.

[By courtesy of Electroflo Meter Co., Ltd.

An oil-immersed gear-type pump (1) draws a continuous flow of gas from the sampling point in the flue. The greater bulk of the sample escapes to atmosphere from an orifice in the pump casing. The residue of the sample, at atmospheric pressure, flows through a tube from which definite volumes are drawn off at 90-second intervals by the primary measuring cylinder (3). The primary measuring cylinder moves up and down through a fixed distance actuated electrically by a crank and connecting rod. A fixed measuring chamber (5) is housed within the measuring cylinder in which oil is maintained at a given level. During its downward movement the measuring cylinder extracts a given volume of flue gas from the supply pipe. The downward movement of the cylinder breaks the oil seal on the fixed measuring chamber which becomes completely filled with flue gas. When the primary measuring cylinder rises the oil-level seals off the end (a) of the feed tube. The volume of gas in the chamber (5) is then forced by the rising oil level into the tank (7) containing the caustic potash solution. By the aid of a suitable baffle arrangement all the CO_2 is effectively absorbed, the residual gas passing into the secondary measuring chamber (9). An oil-sealed bell (10) surrounding the secondary measuring cham-

ber rises to a height inversely proportional to the volume of the CO_2 absorbed. The residual gas from the secondary measuring chamber escapes through the relief tube (11), the lower end of which is exposed when the primary measuring cylinder (3) is at the bottom of its travel. The oil-sealed bell then returns to the zero position. As the primary measuring cylinder rises the cycle of operations restarts, the CO_2 being determined in a new sample of flue gas. Attached to the top of the oil-sealed bell is a vertical capped spindle, the movements of which actuate the indicator pointer and the recording pen on the chart. To provide a continuous indication and record of the CO_2 content in the flue gas the recording pen and indicator mechanism are retained by a suitable brake in the position they assume at the end of each cycle. The brake is released at the appropriate moment by a cam worked by the operating crank on the primary measuring cylinder, the indicator and recording pen moving to new positions with the rise of the oil-sealed bell.

The following advantages are claimed for this type of CO_2 meter: (a) The CO_2 content is measured directly by chemical analysis. No glassware, rubber tube connections or valves are required.

(b) Positive aspiration of the gases from the flues at 18 in. mercury is secured by the oil-immersed pump, but all subsequent analytical processes are carried out with the gases at atmospheric pressure.

(c) All driving and measuring mechanism is continuously oil-immersed.

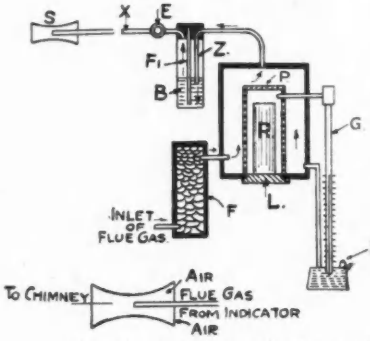
(d) A charge of caustic potash solution large enough to provide for 3200 hours continuous operation is incorporated.

The disadvantages may be stated as: (a) The recorder must be placed in close proximity to the exhaust flue. (To cover this difficulty the makers have patented an electrical transmitting apparatus by which the reading of the meter is recorded on an indicator.

(b) The readings are intermittent although the 90-second cycle available on this instrument largely discounts this criticism.

(c) The apparatus is large and somewhat complicated.

A useful instrument for recording CO_2 values, patented by International Gas Detectors, Ltd., is shown diagrammatically in Fig. 2. Gas is withdrawn from the flue by an aspirator worked by natural draught and fixed in as close proximity as possible to the base of the chimney. Passing first through a filter



[By courtesy of International Gas Detectors, Ltd.

Fig. 2. W.R. (Porous Pot) CO_2 meter.

B—Gas Flow Detector; E—Tap; F—Filter; F_1—Detector Tube Funnel; G—Gauge Tube; L—Lid; P—Porous Pot; P_1—Plug; R—Absorbent; S—Aspirator; X—Return Pipe to Fan Race when induced Draught is Used; Z—Inlet Detector Tube.

for the removal of dust, the gases enter a chamber containing a porous pot. A cartridge of dry chemical reagent, capable of absorbing CO_2, is placed inside the porous pot. From the chamber the gases pass through a bubbler giving visible indication of the rate of gas flow and thence to the aspirator. A certain fraction of the gas in the main chamber diffuses through the walls of the porous pot in the interior of which the CO_2 is absorbed. With the absorption of the CO_2 a decrease in pressure is set up inside the porous pot. A water-sealed gauge tube connected to the interior of the porous pot indicates the decrease in pressure by the height to which the water rises above the base. The readings on the gauge tube may be calibrated directly in terms of CO_2 content and a continuous recorder may also be operated by the apparatus. Although simple and inexpensive, the instrument suffers from the disadvantage that it is very susceptible to changes in the speed of the gases. The rate of diffusion through the porous pot is practically a fixed quantity so that the calibration is only valid for one definite gas speed. The instrument should be of considerable value in small plants where more expensive equipment would not be considered. *(To be continued.)*

New Control Orders

Export of Chemicals

Under the Export of Goods (Control) (No. 31) Order, 1942 (S.R. & O. 1942, No. 1640, price 1d.) which comes into force on September 7, control is extended to cover additional metal manufactures, machinery, electrical goods, chemicals, spectacles and sunglasses made from plastic material, cork stoppers, unexposed sensitised photographic film, etc. Licences will in future be required to export the following classes of goods to all destinations: ethyl cellulose and preparations thereof; manganese sulphate; mixtures of, or containing, potassium hydroxide or lithium hydroxide; unexposed sensitised photographic film (other than paper film). Existing requirements covering certain goods are superseded by the provisions that licences will, in future, be required to export: insecticides, fungicides and weed-killers containing arsenic compounds, chlorinated naphthalenes, cyanides, fluorides, metaldehyde, nicotine or its salts, petroleum oils, pyrethrum or its extracts, or silicofluorides; iron oxides and pigments containing iron oxides, including ochres, siennas, and umbers, rotenone, roots containing rotenone, whether ground or not, extracts containing rotenone and preparations of any of these; bacteriological products, not of a kind used solely for veterinary purposes: antigens, including toxins, toxoids, and tuberculins but not including vaccines, antiviruses, and bacteriophages; sera, including antitoxins and antitoxic globulins.

Collapsible Tubes

The Minister of Supply has made an Order, which comes into force on August 31, limiting the commodities which may be packed in metal collapsible tubes for the home market. It also restricts the sizes and types of tubes and the weights of caps to those specified in the British Standard Specification, No. 1049-1942.

Asbestos in the U.S.S.R.

Large Expansion Planned

BEFORE the Revolution Russia was the second largest producer of asbestos in the world with 25,000 metric tons in 1913, next only to Canada, which produced 124,000 tons. By 1937, however, it had been passed by Southern Rhodesia and equalled by the Union of South Africa. Practically all asbestos is produced in the Ural district, where both mines and mills are located. The largest deposits are near Sverdlovsk and Krasnouralsk; another promising deposit lies near Molotov (formerly known as Perm).

In the past 25 years development of mines and expansion of production have progressed rapidly; output of all grades in 1935 reached 95,000 metric tons. In quality Russian asbestos runs to lower grades; in 1926-27 more than 41 per cent. of the two lowest grades, and only 30 per cent. of the three highest. Most of the low-grade product is suitable only for cement tiles, roofing and other building materials; in 1938 some 86,000 tons were used for these purposes. Until recent years, considerable quantities of Ural asbestos were exported, but for the past three years domestic requirements have absorbed practically all production.

Under the third Five-Year Plan, the expansion of the asbestos mine at Bazhenovo to a capacity of 220,000 tons of selected fibre, excluding waste and powder, was contemplated, and this total was the target for 1942.

Industrial Safety

Man-Power Problem

LORD MCGOWAN, presiding at the annual meeting of the Royal Society for the Prevention of Accidents, said that the Prime Minister had accurately forecast that the year 1942 would present pre-eminently a problem of man and woman power, therefore waste of human material must be avoided. The accident at work, or going to and from the factory, which incapacitated a war worker was just as much a loss to the potential capacity of the nation as if the casualty were directly inflicted by one of Hitler's Huns. They should be proud that in helping to prevent such wastage of war resources the Society was engaged in the most valuable of all salvage campaigns—that which preserved human life.

"It is my firm belief," he said, "that when normal conditions return, industrial accident prevention will be firmly established as an integral part of up-to-date industrial management which no enterprising firm will neglect. War always creates revolutions in technique, and I am sure that systematic accident prevention work in industry will have so proved itself in war time that it will be regarded as equally important in peace."

In seconding the adoption of the report and accounts, Sir Wilfrid Garrett, Chief Inspector of Factories, referred to the harmonius working between the Ministry of Labour and the Society in the effort to reduce accidents in industry. It was difficult to quote figures to show the results of the activity which had taken place owing to the expansion of industry. One of the factors which was influencing the increase in accidents among women was the transfer of women workers from the safer to the more dangerous industries, though many firms had been able to record excellent figures despite the changes made.

Glass Development

Recent Applications in Industry

THE Corning Glass Works are among the most famous in the United States, and their industrial manager, Mr. T. J. Thompson, is one of the leading authorities on the application of glass to industry. A recent paper of his, delivered to the American Ceramic Society and entitled "Glass Goes to War," has been published in *Chemical Industries* (1942, *51*, 1, p. 38), which besides giving a general review of the function of industrial glass to-day, includes some interesting details of the most recent applications. Some of these included hereunder are still under development or have not yet attained large-scale production.

Preliminary experimental work with sintered mixtures of glass and metal powders gives promise of developing useful new materials of construction, some of which would relieve metal shortage.

Tubes of 96 per cent. silica glass are being used to shield sensitive thermo-couples against corrosive furnace atmospheres at temperatures up to 1000° C., displacing special alloys formerly used. Clear 96 per cent. silica glass, because of its heat resistance and transparency to infra-red radiation, has demonstrated unique characteristics as a sole plate for electric irons.

Gauges and Rollers

Boro-silicate glasses offer a number of advantages, among which are hardness and abrasion resistance, as a material for making precision gauges. Their low thermal expansion and low thermal conductivity minimise dimensional changes resulting from temperature changes.

In the textile industry, advantage is being taken of the hardness and abrasion resistance of boro-silicate and 96 per cent. silica glass. Mechanical rolls, securely bonded to accessory metal fittings, complete with ball-bearings, and having precision-finished faces, have been supplied for certain purposes where accuracy and smoothness are important considerations, coupled with resistance to abrasion and corrosion. Rollers of glass, large and small, replace metals in steel-pickling tanks where they are exposed to sulphuric acid, and in numerous other services, such as the conveying of delicate organic films through chemical treating baths without scratching them.

The art of forming glass on a mandrel to extremely precise shape and size is no longer new, but great strides are being made here: great accuracy, coupled with transparency and requisite mechanical strength forms the basis for design of new instruments for visual indication of flow of liquids or gases under pressure, also for construction of precisely-formed mechanical parts. Rotameters, of the type now widely used in the chemical industry, are an example.

In the chemical industry, also, spray nozzles made entirely of glass or having glass parts are replacing metals.

"Foamglas" and "Fiberglas"

The shortage of cork for low temperature insulation and the shortage of magnesia, asbestos and other materials for higher temperatures will shortly be at least partially alleviated by foamed or cellulated glass. This new product, called "Foamglas" by its makers, the Pittsburgh-Corning Corporation, will be available in standard blocks and special shapes having a density of only 10 to 11 lb./cu. ft. and a thermal conductivity of .45 B.Th.U./hr./sq. ft./°F./inch at 70° F. which compares well with cork under actual service conditions. Since the low density is attained by incorporation of small totally-enclosed gas bubbles, the material has no interconnecting pores or channels and does not lose efficiency on exposure to damp. Its upper temperature limit of 1000° F. permits a broad range of industrial applications. It has a tensile strength of about 100 lb./sq. in. and crushing strength of 150 lb./sq. in., thus providing substantial load-carrying capacity. When "Foamglas" becomes commercially available in the near future, the Armstrong Cork Company will collaborate with Pittsburgh-Corning in marketing it in the cold storage field.

Developments in fibrous glass have been well publicised and need no detailed recounting here, but it is worthy of note that "Fiberglas" has made possible substantial reduction in size and weight and quantity of materials needed in electric motors and other electrical equipment. Special glass textiles are being used in military equipment; and special insulating materials permit savings in weight, space, and time in shipbuilding.

New uses of glass in ammunition and ordnance and new optical glasses and methods for producing them are among the war-time developments that cannot yet be described.

A multiple fellowship for the study of chemical containers and storage has been established by the Pittsburgh-Des Moines Steel Company, at the Mellon Institute of Industrial Research, while the International Nickel Company, of New York, has resumed investigational work at the Institute by the establishment of an industrial fellowship to examine certain problems in the chemistry and technology of nickel.

Dust-Determination Advances, II

Physical and Chemical Methods

by S. C. BLACKTIN, Ph.D., M.Sc.

(*Continued from* THE CHEMICAL AGE, *August 22, p. 190*)

IN considering the volume of dust-samples tested, the ratio V/X, *i.e.*, that between the volume of the dispersion sampled and the particle-deposition area is a matter of great importance. An examination of the various ratios follows.

(i) *Ratio V/X varying with particle ingresses.* (a) It is obvious that with any given instrument exhaust capacity, say 48 cc., the greater the number of ingresses, the less the fractional volume per corresponding circle area. (b) Owing to the selecting arrangement in the Electrotor Meter, varying numbers of ingresses can be used with the same total instrument exhaust volume capacity. That is to say, the volume deposition on any given deposit circle may be varied to any suitable extent, as desired, from dispersion to dispersion. Thus, with fixed exhaust volume of 48 cc.—*i.e.*, fixed volume in the absolute sense—and two ingresses open, the value V^1 in the ratio V^1/X^1 would be 24 cc.; with six ingresses open V^1 would equal 3 cc., per ingress. This is relative volume variation.

(ii) *Ratio V/X dependent on number of record rotations.* This type of relative volume variation embodies valuable advances providing the ability to determine (c) many other characteristics of the particles of the dispersion besides number,[5] and (d) weight determinations of dispersions as well as number determinations.[6] The mechanism which permits most economically the use of the rotating record has been previously described.[1,2] The Archimedean screw rotating the record which is horizontally attached may be such as to permit several complete rotations in a full volume sample of, say, 48 cc. In such a case a complete circle deposit due to each ingress open would be obtained from the first 12 cc. of dispersion, *e.g.*, 6 open × 2 cc. each = 12 cc. In this example, the largest deposit circle (of area 100 sq. mm.), of the six concentric annular circles would be particle-deposited from that ingress farthest from the centre of rotation, and the ratio V^1/X^1 for this circle would be 2 : 100, or 50 sq. mm. per cc. of dispersion.

Superposition Avoided

A simple calculation shows that this circle, being of 100 sq. mm. area, could accommodate without any superposition or particle aggregation 33,333,000 particles of 2 μ diameter, or make countable a dispersion of 16,666,000 particles of 2 μ diameter per cc. This indicates the vast countable range, without superposition, made practicable by the type of volume variation 1 (b). To avoid introducing agglomeration and superposition inefficiency into the Electrotor Meter operation, it is inadvisable to use more than one complete rotation for the particle deposit, for *counting* purposes, hence for the values given, *i.e.*, 4 rotations per full instrument stroke and an exhaust chamber of 48 cc. capacity, the all-ingress exhaust sample volume for most accurate count would be 12 cc. For if the six record circles were each completely occupied by the particles deposited from the first 12 cc., of dispersion (*i.e.*, 2 cc. each circle) during the first rotation, those particles from the second 2 cc. per circle arriving during the second rotation would be all superposed, since each circle is completely covered by particles during the first rotation. This superposition would recur with successive rotations also, each rotation piling on a successive layer of particles over the previous layers. But, just as absence of agglomeration and superposition is necessary for exact dispersion determinations by particle count in any instrument, so, on the contrary, excess of agglomeration or superposition is very desirable for dispersion determination by weight of massed particles. In the Electrotor Meter, the three superposed layers instanced build a weighable deposit. The instance of 4 rotations and 48 cc., is, of course, only exemplary.

Count and Weight Determination

Thus both count and weight are achievable at will, independently or successively, by means of (a) the first record rotation (count), and (b) repeated rotation of the record (weight). These propensities for particle determination by both count and weight, with all the concomitant evaluations regarding the particles,[6] are provided by a *single* full volume exhaust of the Electrotor Meter, whose total record area ($=X$) is much greater than that of any other instrument permitting direct count. Though such other instruments are limited to very restricted ranges by the superposition inseparable from fixed records, the small area of such fixed records, in general, does not fit them for utilising such superposition to provide a weighable deposit, by way of compensation.

Weight-determination Departures. The Impinger[7,8] and the Electric Precipitator[9] can provide both weight and count determinations, involving however prolonged

chemical manipulations. The Electrotor Meter provides an advance on this by furnishing direct, purely physical, count-determinations. The Impinger is very cumbrous, and the Electric Precipitator could hardly with safety be used in gassy mines.

Crystal Filters

Recent new departures providing weight determination alone are (1) volatile crystal filters, (2) soluble crystal filters, and (3) "the labyrinth." The volatile and soluble filters which consist, respectively, of napthalene and salicylic acid crystals, require considerable chemical manipulation both before sampling and before weighing. Also, their actual sampling operation is more difficult than that of the purely count-determination physical instruments. This distinction is very important, as seems to be recognised especially for sampling sites such as coal mines, for the Royal Commission on Safety in Mines[12] even discriminates among the physical instruments for convenience and portability by preferring the Konimeter, even though it can provide count only, and has least range of all, only reaching up to about 2000 particles per cc.

The soluble solid filter "cannot bear transport" and needs accessories and power to overcome a resistance of 4 in. to 6 in. of mercury. The volatile filter requires many hours' volatilisation of naphthalene, etc., with which the particles have been as long contaminated before weighing. Of the physical instruments there is no contamination with the Settlement Counter and the Electrotor Meter, and some contamination with the Konimeter and the Owen's Counter.

The Labyrinth Device

The apparent simplicity of volatile and soluble filters is marred by preparatory and subsequent operations, for each separate test; which makes these filters actually much more complex, and absorbing of time and effort, than the Electrotor Meter, the Settlement Counter, the Konimeters, and the Owen's Counter. Further, they depend, like the Thermal Precipitator, on accessories, though the latter also heats the particles to deposit them. The marked potential reactivity of particular matter is recognised,[29,31] and it was because of such reactivity when the dust particles were contaminated by the foreign organic compound of the filter for many hours in the soluble filter, that its inventors sought the alternative of a mechanical device,[13] the "labyrinth." This device may be useful for collecting, on the principle of inertia which it adopts, massive weight samples for bulk chemical analysis purposes; but it subjects the particles to relatively violent treatment, has great relative inconvenience and great reliance on accessories; and it is of lower efficiency than the soluble or volatile filters. It cannot, and probably does not claim, to be regarded as in any way comparable with the precision physical instruments already discussed.

Count-Weight Mechanism. It has been previously noted that a rotating record can be used successively for counts from the first rotation deposit, then weighings from that together with successive superposed rotation deposits. The first rotation can further be used for repetitive count sampling with any particular ingress; and additionally, each successive rotation can be so used if a different ingress is used with each rotation, for each ingress occurs at a distance from the centre different from that of all others. Thus, either single or repetitive counting can be carried out. It is, therefore, valuable to include a mechanical device to predetermine by a stop at what point of the piston-stroke rotation or fractional rotation is completed. This consists of an adaptation of the Archimedean screw which engages with a special sleeve surrounding it; the sleeve engages also with a pointer which moves over a scale calibrated to indicate to what proportion of a rotation any given length of piston-stroke corresponds. By setting the pointer, the permitted length of stroke is predetermined, hence the degree of rotation to suit the desired purpose of any sampling occasion.

Direct-View Counter. This valuable advance is an Ultramicroscope in portable dimensions.[11] It provides, with full efficiency, counts of both solid and liquid particles still dispersed in their gaseous medium, inhibiting superposition, over a range of 10^7 per cc., yet is more portable and convenient than the accessory-carrying units.

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"Dry ice" is to be used by German breweries in larger quantities in place of gaseous carbon dioxide because of the great delays which have occurred in the transport of the gas containers on the German railways. The carbon dioxide manufacturers are organised in several regional cartels, and transport over long distances is generally avoided, but the return of containers has been extremely irregular. Dry ice is produced by about ten carbon dioxide producers and also by I.G. Farbenindustrie and Mannesmann Tube Works.

Daylight Working Conditions

Fuel Saving and Increased Production

A COMMITTEE has been formed by a substantial body of manufacturers and engineers intimately connected with the development of products and mechanical devices now perfected for the provision of daylight working conditions, combined both with safety for the workers and satisfactory black-out during hours of darkness. It is hoped with the co-operation of the various public bodies concerned with the problem, to exert sufficient influence to bring about the consideration of the waste, depression and ill effects on health created by the continued use of artificial lighting in the hours of full daylight.

The principal aims of the committee are: (1) to encourage the use of daylight in factories and abolish the permanent "black-out" conditions, and thus improve working conditions for employees, increase daytime production, and effectively reduce consumption of electricity and fuel; (2) to promote non-commercial co-operation between manufacturers of any products relating to the question and pool information and improvements in order to eliminate waste and to offer the most suitable schemes for the national effort; and (3) to present to the appropriate Government departments and others concerned, all the available data on the benefits of working under daylight conditions.

Effects of Continuous Black-Out

Effects of black-out conditions on production cannot be expressed with mathematical precision, but data, based partly on pre-war research, are available to show that production can be adversely affected by working under artificial lighting conditions, especially where no very special attention has been paid to the artificial lighting system. The following results have been noted: (a) reduction in output; (b) poorer quality of finished article; (c) increase in scrapped material; and (d) increased cost of inspection. The effect of black-out conditions on workers is even less susceptible of exact measurement, but even under the very best conditions of artificial light there is no doubt that most workers suffer to a greater or less degree from the psychological effects of black-out conditions, and there is evidence, although it must be admitted as yet inconclusive, of certain physiological effects. It must be remembered that during the winter months the day-worker enters the factory before daylight, and leaves it after dark, and thus has no chance of seeing the light of day.

It may not be generally known that the policy of Government departments has changed since the effects of enemy action upon factory roof lights have been investigated. Prior to serious air raids the advantage and desirability of giving daylight in factories was fully recognised, and gradually the use of shutters was becoming almost universal. An inspection of the new factories affected by air raids gave the authorities the impression that it was necessary to eliminate roof lights completely from new designs, and where practicable remove existing glass. Furthermore, it was considered that the effect of blast upon mechanical shutters was such as to incur excessive cost of reinstatement and maintenance of this equipment. The use of daylight conditions for working in factories is hampered at present by two main factors: the elimination of roof lights from new designs in Government factories; and the withdrawal of financial support by grant for schemes of mechanical shutters recommended to factory owners.

It is the object of the Committee to show that not only is the reinstatement of daylight working desirable, but that the means are available, and, as shown by the typical estimates set out hereafter, the cost is amply repaid by actual savings effected in the cost of artificial lighting.

Protection of Glass

Glass, when affected by blast, is a source of considerable danger to workers, and where possible should be replaced with glass substitute, of which there are now several proven types available for immediate use. Where glass removal is not practicable, there are several methods of protecting and splinter-proofing it, in order to avoid more than slight risks. Obscuration shutters are marketed by several firms who can now offer perfected installations which, with a reasonable maintenance expenditure, will give efficient service for many years to come. Where new buildings have to be erected in danger zones, consultation with manufacturers will guarantee a safe and practical scheme, provided that the architect is prepared to adapt his designs to the requirements of shutter-makers, which are rarely more than slight changes in steelwork drillings.

There are several treatments available for the protection of glass, consisting of the use of a fabric in conjunction with lacquer or varnish. These treatments are almost as effective for protection of glass as the bitumen scrim process. Substitute glass materials approved by the Ministry of Home Security include: (1) plastic films with wire mesh reinforcement; (2) plastic films with

formed that would, if not disturbed, prevent re-ignition. Talc by itself cannot do this.

We are always ready to advise on this important question of extinguishing light metal fires and incendiary bombs, and would suggest to your numerous readers that experiments with the neat materials recently referred to are likely to have undesired results.—Yours faithfully,

For DURSTON, LANG & CO., LTD.,
G. HAROLD DURSTON,
Technical Director.

Harrow Weald, Middlesex.
August 24, 1942.

Personal Notes

MR. P. W. L. GOSSLING has succeeded Mr. J. C. Jennings as chief chemist of W. B. Dick & Company, Ltd., the London oil refiners. Mr. Jennings died last April at the age of 50.

MR. A. J. GIBSON, Special Officer Lac Inquiry, in addition to his duties as head of the London Shellac Research Bureau, has been appointed Government adviser to the Ministry of Supply on Shellac.

MR. N. B. RADCLIFFE, whose resignation at the end of this month we recently reported, was appointed Principal of the Batley Technical College in 1919. Prior to his appointment at Batley he was head of the Technical Institute at Bingley.

Last week the marriage took place of LT. PETER ROCKWELL, well known as a manufacturing chemist in London, and Miss Wilma Grace Philips, daughter of Lt.-Col. I. S. Philips, of Woodburn Avenue, Aberdeen.

A representative gathering of the staff and foremen of the Ardeer factory of Nobels Explosives Co., Ltd., met recently to make a presentation to MR. W. W. LUMSDEN, managing director of the group, on his retirement after 41 years' service with Nobels.

MR. A. R. BRUCE, formerly Assistant to H.M. Trade Commissioner at Montreal, has been appointed H.M. Trade Commissioner at that post in succession to Mr. T. G. A. Muntz. Mr. Bruce will also have the title of H.M. Trade Commissioner in Newfoundland.

DR. HARRISON E. HOWE, editor of *Industrial and Engineering Chemistry*, Washington, D.C., has been awarded the 1942 Chemical Industry Medal of the Society of Chemical Industry, presented annually to "a person making a valuable application of chemical research to industry." He will receive the award and deliver an address in New York on November 6.

MR. R. H. COMLEY and MR. O. F. SWANBOROUGH, hitherto joint general managers of the Avon Rubber Co., Ltd., have been appointed to the board of the company and to be joint managing directors from August 13.

DR. GODFREY ROTTER, C.B., C.B.E., D.Sc., F.I.C., who has been Director of Explosives Research at the Royal Arsenal since 1921, is to retire shortly. During the last war his inventive faculty led to the design of many important new explosives and processes, notably the well-known "Fuse No. 106."

MR. DOUGLAS R. MACKIE has been appointed sales manager for Monsanto Chemicals, Ltd. He joined Monsanto in 1924, and represented the firm in the Midlands and later in London, his activities subsequently extending to cover the plasticisers, pharmaceutical and fine chemical trades throughout the country. For nearly two years Mr. Mackie has been assistant sales manager.

MR. H. BELL THOMPSON celebrates in 1942 his fiftieth year of association with Sternol, Ltd., oil refiners and lubricant manufacturers, of which he is the managing director, and to mark his golden jubilee a presentation is being made to him by the company. Mr. Thompson joined Sterns, Ltd. (the parent company), as a junior in 1892 and became general manager and a director of the company. On the formation of Sternol, Ltd., in 1928, he was appointed managing director of that company. He is a member of the London Home Counties Committee of the war-time Oil Distributors' Emergency Council, and he has for many years represented the lubricating oil trade on the Grand Council of the Federation of British Industries

Obituary

MR. ERNEST REID, of Dundee, Glasgow representative of Messrs. Thomas Hedley, soap manufacturers, Newcastle, died recently as a result of a sudden illness while on military service.

The death is announced of PROFESSOR RICHARD WILLSTAETTER, professor of chemistry in Munich and Berlin, who died on August 3, aged 70. He was especially noted for his work on plant biochemistry, enzymes, etc.

MR. ROBERT HAMILTON, whose death in Glasgow has been announced, was for 20 years general manager of Langloan Iron and Chemical Co., Coatbridge, holding this position until the liquidation of the company. Previously he was manager of Glengarnock Chemical Co. He had maintained a long association with the Society of Chemical Industry, in which he had served as chairman of the West of Scotland Section.

General News

From Week to Week

Sulphanilamide paste proved satisfactory as a dressing for splashes from mustard gas when a bomb accidently exploded during a demonstration in a Northern region.

The use of peat as a domestic fuel instead of coal, wherever practicable, is advocated by Lord Henley's committee in its report to the Ministry of Fuel and Power.

Valuable machinery, stocks of raw materials and two motor lorries were destroyed in a fire which occurred at the factory of Thomas Hawksfield, Ltd., fibremakers, of West Hartlepool, recently.

Nearly 300 new names are included in the Trading with the Enemy (Specified Persons) (Amendment) (No. 13) Order, 1942 (S.R. & O. 1942, No. 1621), which came into operation on August 22. Deletions from the list number forty-six.

The new hut designed for rapid erection by the Ministry of Works and Planning has a standard framework of reinforced concrete designed for mass production which will take any of the usual types of covering or panelling such as bricks, clay blocks, plaster board, wood, cement, wood-wool between asbestos cement sheets, and wood-wool slabs cement-rendered.

At the recent annual meeting of Low Temperature Carbonisation, Ltd., the chairman, Colonel Bristow, remarked that owing to coal shortage the company had been compelled to work at only half capacity during the past year. The outlook, however, appeared to be a little brighter in this respect, and the Ministry of Fuel and Power had already given valuable assistance.

The Ministry of Supply has re-enforced the provision of the Control of Rubber Tyres (No. 4) Order which prohibited delivery by retreaders of retreaded tyes to anyone except authorised tyre depots. After the No. 4 Order had come into force a Direction (No. 1) was issued which permitted retreaded tyres, received by retreaders before April 4, to be delivered to the customers from whom they had been received. The new Direction (No. 3) withdraws this permission.

The Minister of Fuel and Power has made a new Order entitled the Quarries (Opencast Coal Workings) Order, 1942 (S.R. & O. 1942, No. 1662), which came into force on August 24. This Order exempts all opencast working operations carried on by or on behalf of the Minister of Fuel and Power from the Coal Mines Act, 1911, the Metalliferous Mines Regulation Acts, 1872 and 1875, the Quarries Act, 1894, and from all orders and regulations made under these Acts or any special rules established under the Metalliferous Mines Regulation Act, 1872.

Manufacturers of roofing materials have been instructed that future orders for roofing felt, bitumen, or pitch damp-courses must be accompanied by a certificate stating that the material is required for authorised purposes. The new regulation is to ensure adequate supplies for the war building programme being carried out by Government departments.

After August 31 traders will no longer be permitted to supply rubber boots without buying permits against Factory Inspectors' and similar equivalent certificates issued for such boots before June 15, 1942. From September 1 onwards these certificates will be valid as coupons only, and for rubber boots an official Board of Trade buying permit will be needed as well.

I.C.I. (General Chemicals) Ltd., were fined £5 at Widnes last week, and were ordered to pay 5s. witness fees, for displaying a light from a roofed building at the Gaskell Deacon Works. Mr. Knowles appeared for the defence and submitted a plea of guilty. There was a smile in Court when Mrs. Hanley, who presided, said the I.C.I. would be allowed 14 days in which to pay the fine and costs amounting to £5 5s.

The British Standards Institution has just issued a Standard (B.S. 1056) to cover the war-time painting of buildings and to indicate how, in view of the shortage of raw materials and in the interests of national economy, paints and paint materials can be most wisely used on buildings. Four schedules deal very comprehensively with different classes of buildings, new and old, likely to require painting.

Further details are now available concerning Celanese Plastics Development, Ltd., the new subsidiary of British Celanese, which was formed last month. The chairman is Sir John Wardlaw-Milne, K.B.E., M.P., and the other directors are Sir Harold Webbe, M.P., Mr. J. H. Rooney, Dr. G. Rudolf, and Dr. N. A. C. Friend, of whom the last three have long been associated with the commercial, technical, and scientific activities of the parent company. Mr. A. R. Currie, secretary of the new company, has been assistant secretary of British Celanese for many years.

The necessity for the provision of a British Standard for commercial invoices (B.S. 1055) has been largely dictated by the imperative need of conservation of paper owing to the present war conditions. Its preparation was authorised by the Paper Industry Committee at the request of the Federation of British Industries. In addition, the general adoption of a broad basis of standardised lay-out, such as that specified, is calculated to conserve labour. Copies of B.S. 1055 may be obtained from the Institution, 28 Victoria Street, London, S.W.1, for 1s. 3d. post free.

The price of Rochelle Salt (sodium-potassium tartrate) has been changed to 277s. 6d. per cwt.

The secretary of the Midlands Centre of the Electrodepositors' Technical Society has been notified by Dr. D. S. Anderson, Principal of the Birmingham Central Technical College, that a course in Electrodeposition has been arranged for the next session. Evening classes will not be held, but in their place Saturday and Sunday afternoon classes are being arranged. Enrolment takes place on September 19 and 20, 2.30—4.30 p.m. Members are asked to bring these classes prominently to the attention of juniors who may be in their employ or with whom they are acquainted.

Foreign News

The Swiss Government is encouraging the production of liquid fuels from sawdust and shavings. The first product of this kind is an acetone-containing wood spirit.

Canada's rapidly-expanding synthetic rubber industry is expected to produce 14,000 tons in 1943 and eventual annual production is estimated at 40,700 tons.

Increased production of high-quality rotenone-bearing roots in the Amazon Valley is the aim of a survey undertaken jointly by the U.S. and Brazilian Governments. To begin with, a preliminary survey of the wild rotenone-producing plants will be made.

In an address to the Rotary Club at Johannesburg, Mr. T. Coulter, a consulting engineer, said that he thought it not inconceivable that at some future time the huge reserves of coal in the Union would be put to good use in the production of fuel oil.

A new cork product is being developed in Italy. Under the title of "flessughero"—which might be rendered as "flexicork"—it is said to combine the most useful qualities of cork and linoleum, and it claims to serve as a substitute for leather.

Increases of 20 to 100 per cent. in the yield of potato plants can be obtained, according to the reports of the German Botanical Society, by the treatment of seed potatoes with natural gas or ethylene. It is claimed that the gas treatment is cheaper than the use of growth-promoting hormones.

The Spanish shale-oil distillation plant at Puertollano, the first one to be erected in the country (1941), has reported its output for the first year as follows in metric tons: motor spirit, 941; gas oil, 324; fuel oil, 2967; creosote, 2486; lubricating oil, 187; paraffin wax, 180; sulphate of ammonia, 440.

Because of reduced imports of edible fats, ground-nuts have been chosen by the Palestine Government as the solution to the problem of self-sufficiency. Experience has shown that ground-nut cultivation in Palestine is a profitable venture, and yields are reported to be the highest in the world.

Methane is now being reclaimed from sewer gas in Zurich, Switzerland, and the city council has voted 600,000 francs for installation of equipment. One cubic meter of methane is reported to be yielded by 1½ cu.m. of sewer gas, and the new installation will deal with 70,000 cu.m. of gas per month.

Adhesives were reported as the chief products of 20 Canadian factories in 1941, and their output aggregated $3,000,000, says *Foreign Commerce Weekly*. Production of bone and hide glue amounted to 3100 tons, valued at $1,086,000. Vegetable glues, fish glues, household cements, and similar items made up the remainder of the output.

A new American boom town is reported to have sprung up at Las Vegas, Nevada, owing to the construction of the plant ordered by the Basic Magnesium Incorporated, 45 per cent. of the capital of which is British. It is the world's largest concern of its kind. The weekly pay-roll is said to be more than £225,000.

New methods of treating wood, by which it can be made as resistant as armour plate or as resilient as rubber are being developed in the United States and may be extended to Canada, states Reuter. The formula of Dr. M. Wladaver, of New York, which is adaptable to either hard or soft woods, has been approved by his Government, and he is now in Ottawa discussing plans to open a plant.

Forthcoming Events

"An organic chemist looks at life" is the title of the address that Professor Todd will give to the Manchester University branch of the **Association of Scientific Workers** on **August 31.**

The first meeting of the **Electrodepositors' Technical Society,** in the session 1942-43 will take place in Birmingham on Tuesday, **September 1,** at 6 p.m., at the James Watt Memorial Institute, Great Charles Street, when the chairman of the Midlands Centre, Dr. S. Wernick, will deliver an address on "The Trend of Metal Finishing Development."

An open meeting to support and discuss proposals for a Central Scientific and Technical Board has been arranged by the **Association of Scientific Workers.** It will take place on **September 4,** at 7 p.m., at the Caxton Hall, Westminster. The main speaker will be Lord Strabolgi.

A meeting of the **Midland Association of Gas Engineers and Managers** will be held on **September 10,** at 2.30 p.m., at King Edward House, New Street, Birmingham, when, in an informal address, Mr. E. V. Evans, chairman of Council, The Gas Research Board, will deal with the function of chemistry in the gas industry.

Company News

Low Temperature Carbonisation, Ltd., announce a trading profit of £133,049 for the year ended March 31 (last year £123,343). An ordinary dividend of 3½ per cent. is recommended. Forward, £32,872.

The Staveley Coal & Iron Co., Ltd., has declared a final ordinary dividend of 4½ per cent., making 6 per cent. for the year ended June 30. Net profit, after allowing for taxation and war damage insurance, is £271,634 (£294,429).

Chemical and Allied Stocks and Shares

BUSINESS in most sections of the Stock Exchange has been on a smaller scale, and main attention has been given to British Funds and other high-grade investment securities. With few exceptions, movements on balance were small, and among most industrial shares did not exceed more than a few pence. Imperial Chemical at 33s. were slightly above the level ruling a week ago, while the 7 per cent. preference units were also quoted at 33s. The interim dividend on I.C.I. ordinary units is due to be announced next month, and it is generally expected it will be the same as a year ago. Lever & Unilever at 28s. 9d. were 3d. better than a week back, as were Turner & Newall at 68s. 9d. An improvement from 34s. 6d. to 35s. 3d. was recorded in British Match shares. Business up to 68s. 6d. has recently been recorded in B. Laporte. Fison Packard were 38s. 1½d. and elsewhere W. J. Bush transferred at the higher level of 46s. Burt Boulton shares were quoted at 15s. British Glues & Chemicals 4s. shares were dealt in at 6s. 4½d. at one time, and the participating preference at 30s., while Greeff-Chemicals 5s. shares transferred up to 5s. 9d. United Molasses at 28s. 4½d. were within 1½d. of the price current a week ago.

Rayon shares were firm, with British Celanese 11s. 9d. and Courtaulds 37s. 9d. Considerable interest has attached to the registration of Celanese Plastics Development, Ltd., a new subsidiary of British Celanese. British Industrial Plastics 2s. shares transferred up to 5s. and Erinoid 5s. shares were also again on the up-grade, being dealt in up to 11s. 6d., while Lacrinoid Products 2s. shares were again around 4s. 7½d. Among other shares with interests in plastics, Catalin ordinary and Thomas De La Rue have been rather more active. The units of the Distillers Co. were very firm, and at 78s. 6d. were within 6d. of the level ruling a week ago. There was again a good deal of activity in British Plaster Board 5s. ordinary shares, which were maintained at 26s., but elsewhere, Associated Cement eased to 49s. 4½d.

Iron, steel and kindred issues maintained a firmer undertone; United Steel were 23s. 6d.; Dorman Long 19s. 6d.; Stewarts & Lloyds 47s. 4½d.; and Tube Investments 85s. 7½d. Following an earlier improvement, however, Guest Keen eased slightly to 26s. Allied Ironfounders were 34s. 6d. and Babcock & Wilcox 44s. 6d. At 33s. Barry & Staines held their recent improvement, and although best prices made in the past few days were not maintained, Imperial Smelting at 11s. 7½d. were slightly better compared with a week ago, as were General Refractories at 13s. 1½d.

British Drug Houses have transferred at 18s. 9d. and business up to 12s. was shown in Goodlass Wall 10s. ordinary. Morgan Crucible preference shares showed more business; the 5½ per cent. changed hands at 25s. 9d. and the 5 per cent. at 22s. 6d. Monsanto Chemicals 5½ per cent. were again quoted at 22s. 6d. Firmness was maintained in Borax Consolidated at 33s. 3d., and in Murex at 96s. 3d. Triplex Glass remained steady at 33s. 3d., awaiting the dividend announcement. United Glass Bottle were 55s. and Forster's Glass 10s. shares showed dealings up to 22s. Wall Paper Manufacturers deferred were 27s. 6d. compared with 27s. 9d. a week ago. International Paint held their recent advance to 102s. 6d. British Aluminium were 44s. 9d. and British Oxygen 66s. 6d., but Dunlop Rubber eased to 28s.

Among textile issues, recent gains were not fully held by Bradford Dyers and Calico Printers, sentiment having been governed by the prevailing trend on the Stock Exchange earlier this week. Elsewhere, Boots Drug were steady at 35s. 6d. Awaiting the interim dividend announcement, Beechams Pills were little changed at 12s. 6d. Sangers were 17s. 4½d., and Timothy Whites 22s. 10½d. The Russian war news had an adverse influence on leading oil shares, including Anglo-Iranian, Burmah oil, and "Shell."

British Chemical Prices

Market Reports

IN most sections of the general chemicals market trading conditions remain satisfactory from the point of view of the volume of fresh inquiry and also the deliveries against existing contracts. Values display a firm undertone and quotations, almost without exception, are firm. In the soda products section, hyposulphite of soda is firm and in good request and a steady call is reported for bichromate, yellow prussiate, and chlorate, although offers of these items are on a restricted scale. Among the potash products there is little change and

supplies of most items continue scarce. Oxalic, citric, and tartaric acids are firm, and elsewhere formaldehyde is a good market. There is little to report from the coal-tar products market this week; carbolic acid crystals are receiving an active inquiry and a fair trade is passing in naphtha, pitch and toluol. Pyridine is a quiet section.

MANCHESTER.—Chemical market prices during the past week have continued on a generally firm basis, and although actual changes have been few, the trend in several sections is towards still higher levels. On the whole, allowing for seasonal conditions, contract commitments are being drawn against steadily and a moderate weight of new business has been placed this week in soda ash, bicarbonate of soda and caustic, with a steady trade reported in most of the acid products. Among the by-products good quantities of the benzols and toluols and also of creosote oil, carbolic acid and cresylic acid are moving into consumption.

GLASGOW.—Business in the Scottish heavy chemical trade has again been rather quiet during the past week both for home and export. Prices generally remain very firm at about previous figures.

Price Changes

Barium Chloride.—98/100%, prime white crystals, £16 10s. to £19 10s. per ton, bag packing, ex works; imported material would be dearer.

Chrometan.—Crystals, 5½d. per lb.

Formaldehyde.—£24 5s. to £25 10s. per ton d/d. MANCHESTER: 40%, £24 10s. to £26 10s. per ton in casks, according to quantity, d/d.

Naphtha.—Solvent, 90/160°, 2s. 2d. to 2s. 6d. per gal.; heavy, 90/190°, 1s. 10d., naked at works. MANCHESTER: 90/160°, 2s. to 2s. 3d. per gal.

Sodium Hyposulphite.—Pea crystals, £20 per ton for 2-ton lots; commercial, £15 per ton; photographic, £22 per ton.

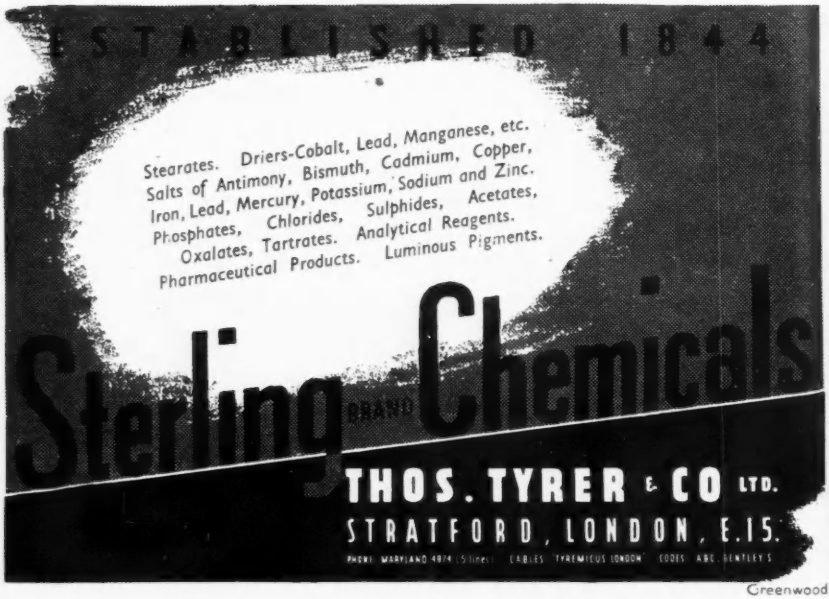
Sodium Sulphate (Salt Cake).—MANCHESTER: £4 15s. per ton.

Sodium Sulphide.—Solid 60/62%, spot, £16 10s. per ton d/d in drums; crystals, 30/32%, £12 10s. per ton d/d in casks.

Turpentine.—American, £4 7s. per cwt., in drums or barrels as imported.

Vegetable Lamp Black.—£49 per ton.

A new aluminium plant with an annual capacity of 8000 tons will be built by Empresa Electro-Mecánica de Córdoba, in Spain. At present Aluminio Español, credited with an output of 2000 tons per annum, is the only light metal producer in the country. A scheme for the establishment of a magnesium industry is under consideration. Investments of 20 million pesetas would be necessary, and construction would last two years.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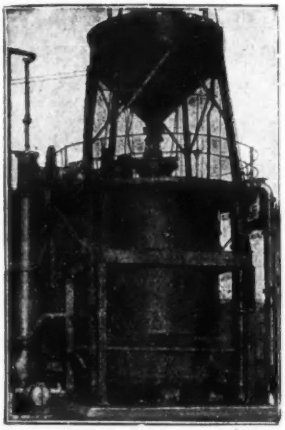

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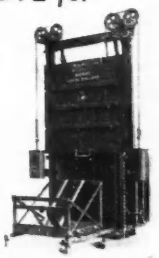
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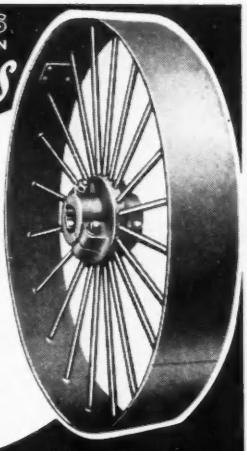

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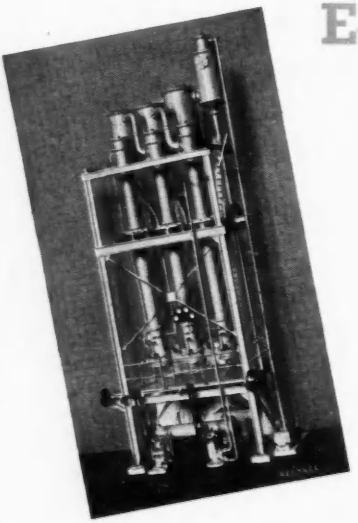

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